Using Video Detection
For Transit Queue Jump

Javad Mirabdal

415.701.4421, javad.mirabdal@sfmta.com

Transit Priority Group

San Francisco Municipal Transportation Agency

Presentation Outline

- Background
  - » 1989 Loma Prieta Earthquake
  - » Traffic Congestion in Downtown Area
- Video Detection For Transit Priority (Queue Jump)
  - » Why Video Detection
  - » How Video Detection is Used
  - » The Result
- Conclusions

Problem Statement

Market Street

Mission Street

Howard Street

Battery Street

North

Transbay Terminal

Boarding Island

Boarding Island

First Street

First Street

Bush Street

Bus Stop Relocated to Bush St. Boarding Island

Bus Stop Relocated to Eastside Boarding Island

→ Initial Route

→ Route with queue-jump and new boarding island

● Relocated Bus Stop

Queue Jump

First

Camera's
Field of View

Camera

Howard

MUNI Signal
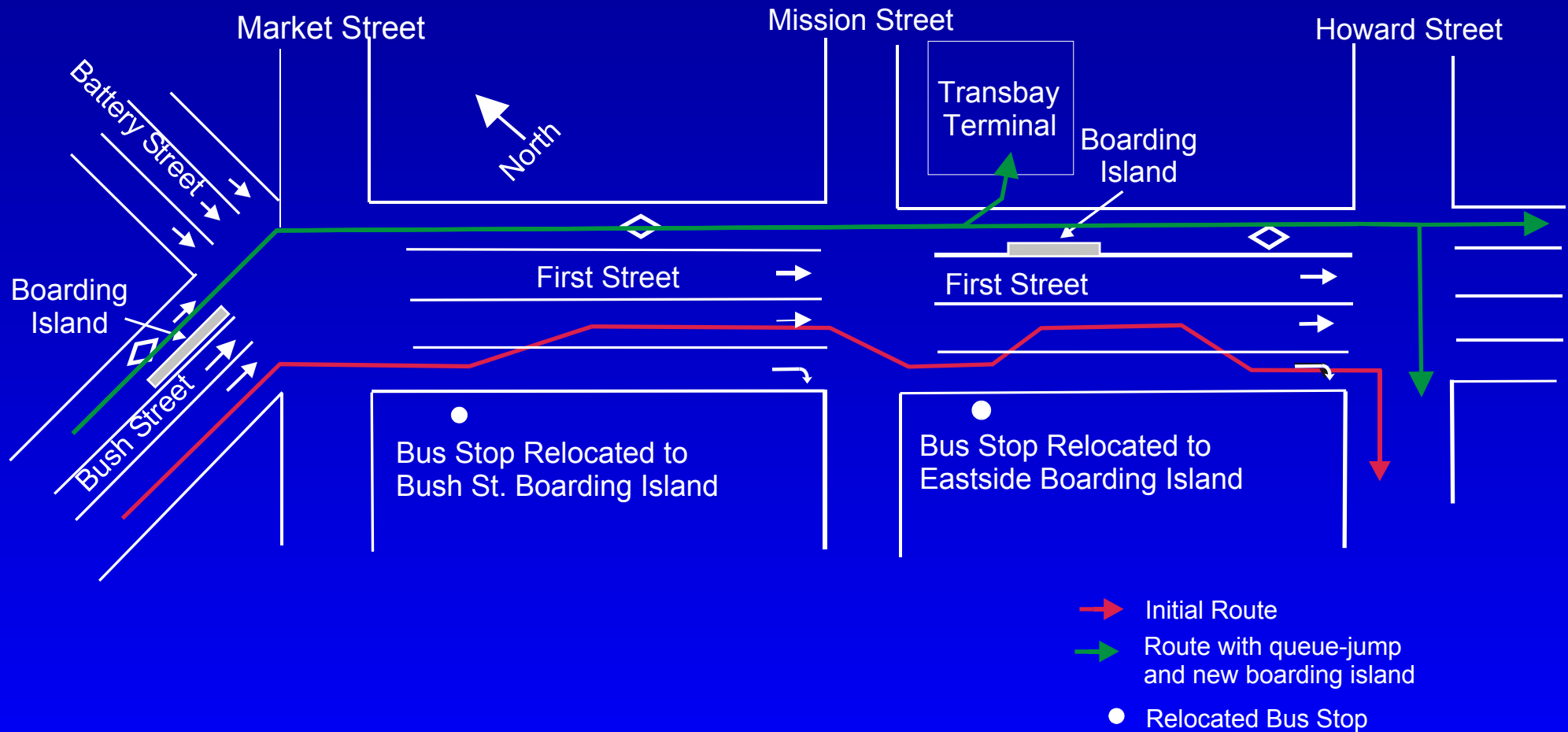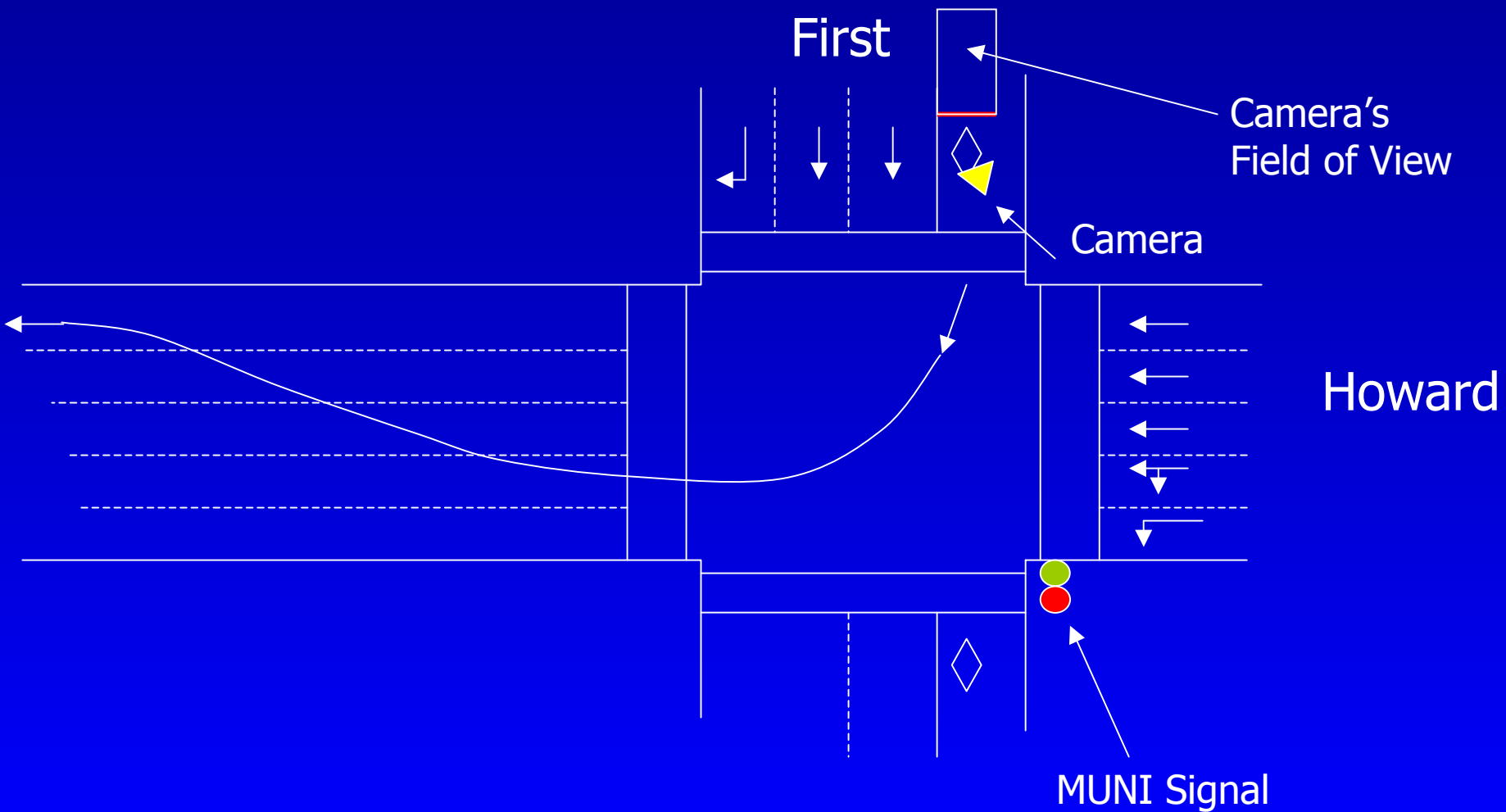
What is Queue Jump

- Queue Jump Gives Priority to one Mode Over Another
- Queue Jump has various applications
- It Can be a fixed phase or an Actuated Phase
- Pedestrian Head Start
- Transit Queue Jump
- Commercial Vehicles Queue Jump
- Right turn conflict with Pedestrian

Existing Transit Vehicle Detection System

- Overhead Line Detection System
  - » Overhead Contact Pan
  - » Overhead inductive loop
- VETAG.   Vehicle Tagging (Identification) System
- Presence Loop Detector in Exclusive Right-of-Way
- Cable Car Mechanical Switches
- Infrared System
- Push Buttons
- Video Detection

Why Video Detection?

- Cheap
- Flexible
- Could be designed to be a "smart" detector

How Camera Detects Turning Bus

Need a way to differentiate:

- Bus from other vehicles
  - » Length of object
- Right-turning buses from other buses
  - » Location
  - » Time

Distinguishing Bus from Other Vehicles - Length

Camera's Field of View

Will trigger queue jump?

Yes   Yes   Yes   No

Distinguishing Right-turning Buses from Other Buses - Location and Time

Stop line for bus detection
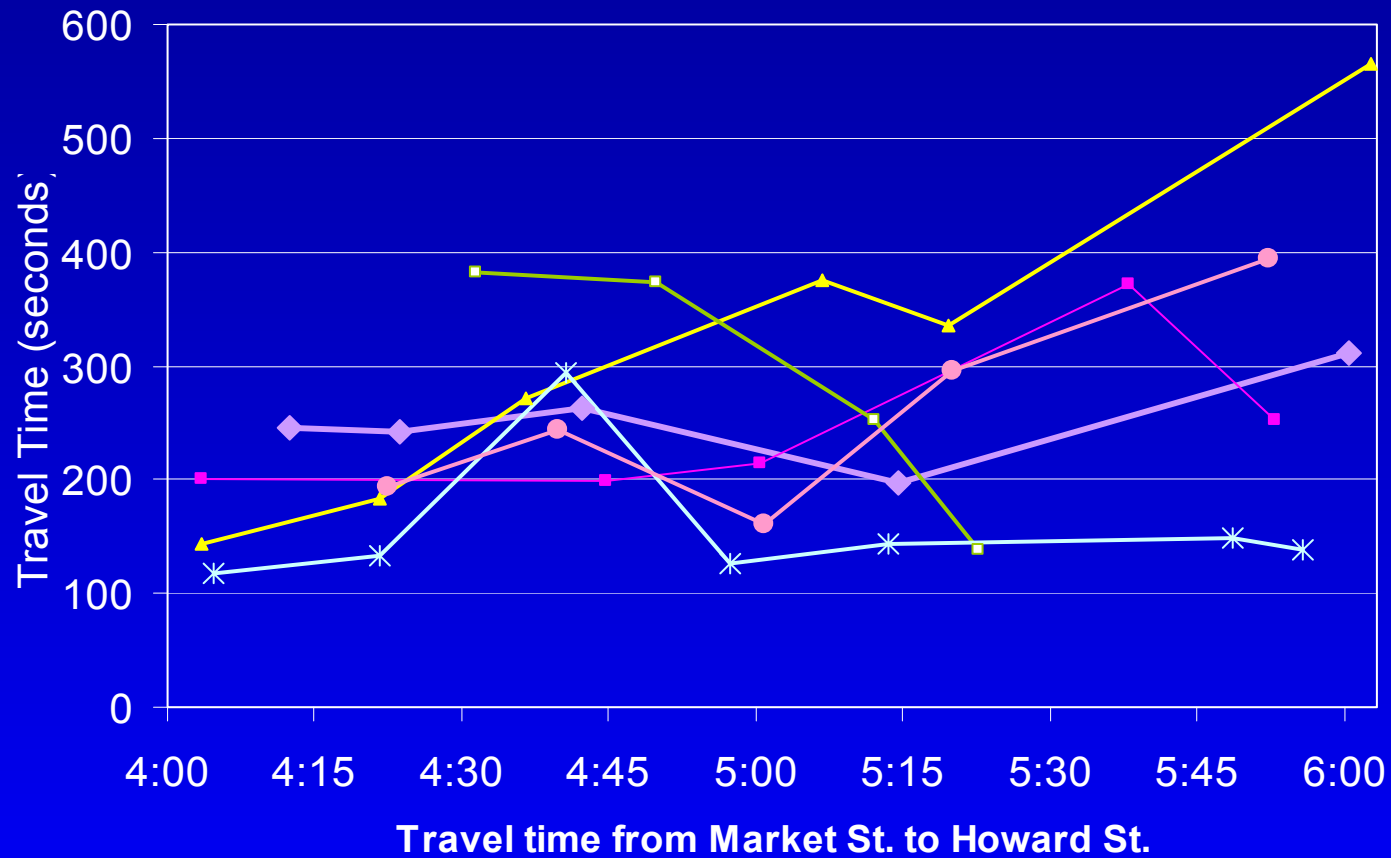
Approaching Bus Video

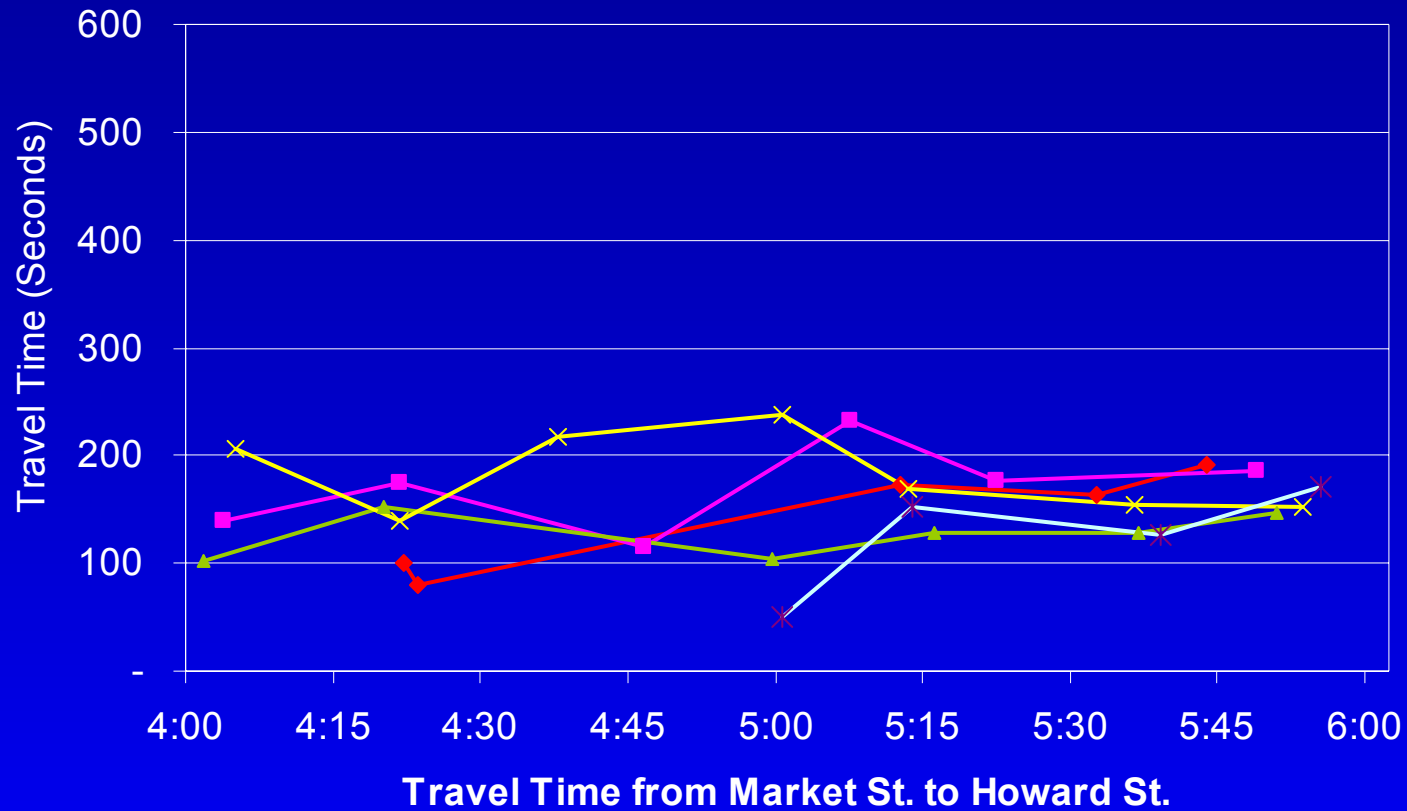# Flashing RX Video

Flashing RX to GX Video

Turning Bus Video

Before Travel Time

Travel time from Market St. to Howard St.

After Travel Time

Travel Time from Market St. to Howard St.

Before and After Travel Time Study

	Before (32 Buses)		After (28 Buses)		Savings	
	(min)	(sec)	(min)	(sec)	(min)	(sec)
Average	04:07	247	02:33	153	01:34	94
Min. Time	01:57	117	00:50	50		
Max Time	09:25	528	03:58	238	Time Savings 38%	
St. Dev.	01:43	103	00:44	44		

Conclusion and Recommendations

- We have to be innovative to improve transit operation

- Video Detection Systems can be used as a Smart Detection System for Transit Priority (Queue Jump)

- Small scale, low cost improvements can have significant effects on system reliability.